

CLAIMS

1. An incombustible withdrawing system for withdrawing an incombustible from a fluidized-bed furnace having a fluidized bed formed therein by a fluidized
5 medium, said incombustible withdrawing system comprising:

a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of the fluidized-bed furnace;

a fluidized-bed separating chamber disposed downstream of said mixture delivery path to fluidize the mixture by a fluidizing gas and to separate the mixture
10 into a first separated mixture having a high concentration of the fluidized medium and a second separated mixture having a high concentration of the incombustible;

a return passage to return the first separated mixture to the fluidized-bed furnace; and

an incombustible discharge passage to discharge the second separated
15 mixture to an exterior of the fluidized-bed furnace.

2. The incombustible withdrawing system as recited in claim 1, wherein said incombustible discharge passage is disposed downstream of said fluidized-bed separating chamber.
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3. The incombustible withdrawing system as recited in claim 2, wherein said incombustible discharge passage delivers the second separated mixture vertically upward and discharges the second separated mixture from a position located higher than a surface of the fluidized bed to the exterior of the fluidized-bed
25 furnace.

4. The incombustible withdrawing system as recited in claim 3, further comprising a fluidized medium delivering device to deliver the second separated mixture in a vertical direction in said incombustible discharge passage.
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5. The incombustible withdrawing system as recited in claim 3, further comprising a fluidized medium delivering device to deliver the second separated mixture in said incombustible discharge passage with at least an angle of repose of

the fluidized medium with respect to a horizontal plane.

6. The incombustible withdrawing system as recited in claim 1, wherein said fluidized-bed separating chamber comprises a passage portion connected to
5 said incombustible discharge passage,

wherein said passage portion has cross-sectional areas gradually increased toward said incombustible discharge passage, and a bottom surface inclined downward to said incombustible discharge passage.

10 7. An incombustible withdrawing system for withdrawing an incombustible from a fluidized-bed furnace having a fluidized bed formed therein by a fluidized medium, said incombustible withdrawing system comprising:

a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of the fluidized-bed furnace; and

15 an incombustible discharge passage disposed downstream of said mixture delivery path to deliver the mixture vertically upward and to discharge the mixture from a position located higher than a surface of the fluidized bed to an exterior of the fluidized-bed furnace.

20 8. The incombustible withdrawing system as recited in claim 7, further comprising a fluidized medium delivering device to deliver the mixture in a vertical direction in said incombustible discharge passage.

25 9. The incombustible withdrawing system as recited in claim 7, further comprising a fluidized medium delivering device to deliver the mixture in said incombustible discharge passage with at least an angle of repose of the fluidized medium with respect to a horizontal plane.

30 10. The incombustible withdrawing system as recited in claim 9, wherein said incombustible discharge passage is disposed so that a small clearance is produced between an inner surface of said incombustible discharge passage and said fluidized medium delivering device.

11. The incombustible withdrawing system as recited in claim 10, wherein the clearance is in a range of from about 5 mm to about 75 mm.

12. An incombustible withdrawing system for withdrawing an
5 incombustible from a fluidized-bed furnace having a fluidized bed formed therein by a fluidized medium, said incombustible withdrawing system comprising:

a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of the fluidized-bed furnace;

10 an incombustible discharge passage disposed downstream of said mixture delivery path;

a fluidized medium delivering device to deliver the mixture vertically upward in said incombustible discharge passage to an exterior of the fluidized-bed furnace; and

15 a projection projecting radially inwardly from an inner surface of said incombustible discharge passage.

13. The incombustible withdrawing system as recited in claim 12, wherein said projection is disposed so as to form a clearance of at least about 20 mm between said projection and said fluidized medium delivering device.

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14. An incombustible withdrawing system for withdrawing an incombustible from a fluidized-bed furnace having a fluidized bed formed therein by a fluidized medium, said incombustible withdrawing system comprising:

25 a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of the fluidized-bed furnace;

an incombustible discharge passage disposed downstream of said mixture delivery path; and

30 a screw conveyor having a screw vane to deliver the mixture vertically upward in said incombustible discharge passage to an exterior of the fluidized-bed furnace, said screw conveyor having a blocking member provided on a rear face of said screw vane.

15. The incombustible withdrawing system as recited in claim 14, wherein

said blocking member comprises a rear vane provided continuously on said rear face of said screw vane.

16. The incombustible withdrawing system as recited in claim 14, wherein
5 said blocking member comprises a plurality of ribs attached on said rear face of said screw vane.

17. The incombustible withdrawing system as recited in claim 14, wherein
10 said blocking member has an angle of $(90 - A + B)$ with respect to said screw vane, where A is an inclination angle of said screw conveyor, and B is an angle of repose of the mixture.

18. An incombustible withdrawing system for withdrawing an
incombustible from a fluidized-bed furnace having a fluidized bed formed therein
15 by a fluidized medium, said incombustible withdrawing system comprising:

a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of the fluidized-bed furnace;

an incombustible discharge passage disposed downstream of said mixture
delivery path;

20 a fluidized medium delivering device to deliver the mixture vertically upward in said incombustible discharge passage to an exterior of the fluidized-bed furnace; and

a blowing device to blow a gas into a lower portion of said fluidized
medium delivering device to increase pressure of the lower portion of said fluidized
25 medium delivering device.

19. A fluidized-bed furnace system comprising:

a fluidized-bed furnace having a fluidized bed formed therein by a
fluidized medium to combust, gasify, or pyrolyze an object containing an
30 incombustible; and

an incombustible withdrawing system comprising:

a mixture delivery path to deliver a mixture of the fluidized
medium and the incombustible from a bottom of said fluidized-bed furnace;

a fluidized-bed separating chamber disposed downstream of said mixture delivery path to fluidize the mixture by a fluidizing gas and to separate the mixture into a first separated mixture having a high concentration of the fluidized medium and a second separated mixture having a high concentration of the incombustible;

a return passage to return the first separated mixture to said fluidized-bed furnace; and

an incombustible discharge passage to discharge the second separated mixture to an exterior of said fluidized-bed furnace.

20. The fluidized-bed furnace system as recited in claim 19, wherein said incombustible discharge passage is disposed downstream of said fluidized-bed separating chamber.

21. The fluidized-bed furnace system as recited in claim 20, wherein said incombustible discharge passage delivers the second separated mixture vertically upward and discharges the second separated mixture from a position located higher than a surface of said fluidized bed to the exterior of said fluidized-bed furnace.

22. The fluidized-bed furnace system as recited in claim 21, further comprising a fluidized medium delivering device to deliver the second separated mixture in a vertical direction in said incombustible discharge passage.

23. The fluidized-bed furnace system as recited in claim 21, further comprising a fluidized medium delivering device to deliver the second separated mixture in said incombustible discharge passage with at least an angle of repose of the fluidized medium with respect to a horizontal plane.

24. The fluidized-bed furnace system as recited in claim 19, wherein said fluidized-bed separating chamber comprises a passage portion connected to said incombustible discharge passage,

wherein said passage portion has cross-sectional areas gradually increased toward said incombustible discharge passage, and a bottom surface inclined

downward to said incombustible discharge passage.

25. A fluidized-bed furnace system comprising:

5 a fluidized-bed furnace having a fluidized bed formed therein by a fluidized medium to combust, gasify, or pyrolyze an object containing an incombustible; and

an incombustible withdrawing system comprising:

10 a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of said fluidized-bed furnace; and an incombustible discharge passage disposed downstream of said mixture delivery path to move the mixture vertically upward and to discharge the mixture from a position located higher than a surface of said fluidized bed to an exterior of said fluidized-bed furnace.

15 26. The fluidized-bed furnace system as recited in claim 25, further comprising a fluidized medium delivering device to deliver the mixture in a vertical direction in said incombustible discharge passage.

20 27. The fluidized-bed furnace system as recited in claim 25, further comprising a fluidized medium delivering device to deliver the mixture in said incombustible discharge passage with at least an angle of repose of the fluidized medium with respect to a horizontal plane.

25 28. The fluidized-bed furnace system as recited in claim 27, wherein said incombustible discharge passage is disposed so that a small clearance is produced between an inner surface of said incombustible discharge passage and said fluidized medium delivering device.

30 29. The fluidized-bed furnace system as recited in claim 28, wherein the clearance is in a range of from about 5 mm to about 75 mm.

30. A fluidized-bed furnace system comprising:

a fluidized-bed furnace having a fluidized bed formed therein by a

fluidized medium to combust, gasify, or pyrolyze an object containing an incombustible; and

an incombustible withdrawing system comprising:

5 a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of said fluidized-bed furnace;

an incombustible discharge passage disposed downstream of said mixture delivery path;

10 a fluidized medium delivering device to deliver the mixture vertically upward in said incombustible discharge passage to an exterior of said fluidized-bed furnace; and

a projection projecting radially inwardly from an inner surface of said incombustible discharge passage.

15 31. The fluidized-bed furnace system as recited in claim 30, wherein said projection is disposed so as to form a clearance of at least about 20 mm between said projection and said fluidized medium delivering device.

32. A fluidized-bed furnace system comprising:

20 a fluidized-bed furnace having a fluidized bed formed therein by a fluidized medium to combust, gasify, or pyrolyze an object containing an incombustible; and

an incombustible withdrawing system comprising:

a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of said fluidized-bed furnace;

25 an incombustible discharge passage disposed downstream of said mixture delivery path; and

30 a screw conveyor having a screw vane to deliver the mixture vertically upward in said incombustible discharge passage to an exterior of said fluidized-bed furnace, said screw conveyor having a blocking member provided on a rear face of said screw vane.

33. The fluidized-bed furnace system as recited in claim 32, wherein said blocking member comprises a rear vane provided continuously on said rear face of

said screw vane.

34. The fluidized-bed furnace system as recited in claim 32, wherein said blocking member comprises a plurality of ribs attached on said rear face of said screw vane.

35. The fluidized-bed furnace system as recited in claim 32, wherein said blocking member has an angle of $(90 - A + B)$ with respect to said screw vane, where A is an inclination angle of said screw conveyor, and B is an angle of repose of the mixture.

36. A fluidized-bed furnace system comprising:
a fluidized-bed furnace having a fluidized bed formed therein by a fluidized medium to combust, gasify, or pyrolyze an object containing an incombustible; and
an incombustible withdrawing system comprising:
a mixture delivery path to deliver a mixture of the fluidized medium and the incombustible from a bottom of said fluidized-bed furnace;
an incombustible discharge passage disposed downstream of said mixture delivery path;
a fluidized medium delivering device to deliver the mixture vertically upward in said incombustible discharge passage to an exterior of said fluidized-bed furnace; and
a blowing device to blow a gas into a lower portion of said fluidized medium delivering device to increase pressure of the lower portion of said fluidized medium delivering device.